EUFAR.net
European Fleet for Airborne Research

Introduction to EUFAR

Integrating Activity of the EC FP7

Budget 8 M€ ***Duration 4 years (2008-2012)*** ***33 Partners***

7 instruments and 19 aircraft open to Trans-national Access

www.eufar.net

Jean-Louis Brenguier, Coordinator

EC Work Program for RIs

EUFAR is an Integrating Activity of the 7th EU Framework Program for Research Infrastructures

Objectives

- **To provide scientists with access at equal terms to the most complete range of research infrastructures**
  - To develop trans-national access to national infrastructures
  - Reduce redundancy and fill the gaps
  - Improve the service by strengthening expertise through exchange of knowledge, development of standards and protocols, constitution of data bases, and joint instrumental research activities
  - Promote the use of research infrastructures, especially for young scientists from countries where such infrastructures are lacking

EC Support to Airborne RIs

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007

TRANS-NATIONAL ACCESS PROGRAMMES

STAAARTE	CAATER
3 aircraft, 44 users, 433 flight hours, 3.1 M€	4 aircraft, 24 users, 240 flight hours, 2.6 M€

INFRASTRUCTURE NETWORKING

EURASER	EUFAR-FP5
0.1 M€	0.64 M€

PREPARATORY PHASE STUDY
COPAL-FP7 - 1 M€
WP2 : Legal Structure
WP3 : Aircraft selection and Costs
WP4 : Designation of the operators
WP5 : Network for Instrumentation
WP6 : Scientific Governance

INTEGRATED INFRASTRUCTURE INITIATIVE EUFAR-FP6

25 aircraft,
230 users, 420 flight hours
Networking (0,9 M€) ,
TA (2,9 M€),
JRA (0,9 M €),
MGT (0,3 M€)
TOTAL : 5 M€

INTEGRATED INFRASTRUCTURE INITIATIVE EUFAR-FP7

25 aircraft or instruments,
205 users, 520 flight hours
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TOTAL : 8 M€

The existing European Fleet









OPERATORS	CATEGORIES				
	1. Strato. jet	2. Jets	3. Large A/C	4. Medium A/C	5. Small A/C
Geophysica EEIG	Geophysica				
DLR		HALO		Cessna 208B	
NLR		Citation			
ENVISCOPE		Learjet			Partenavia
SAFIRE		F-20	ATR-42		Piper-Aztec
MetOffice			BAe-146		
NERC				Do-228	
INTA				2 CASA-212	
TAU				King-Air 200	
GTK				Twin-Otter Caravan	
TU-BS				Do-128	
FUB					Cessna 207 TMG-ASK-16
UNIMAN					C-182
CNR-IBIMET					ky-Arrow
IFU					Microlight
TOTAL AIRCRAFT : 24	**1**	**4**	**2**	**8**	**9**
k€ /flight hour:	**16**	**9 - 28**	**9 - 11**	**3 to 6**	**0.8 to 3**



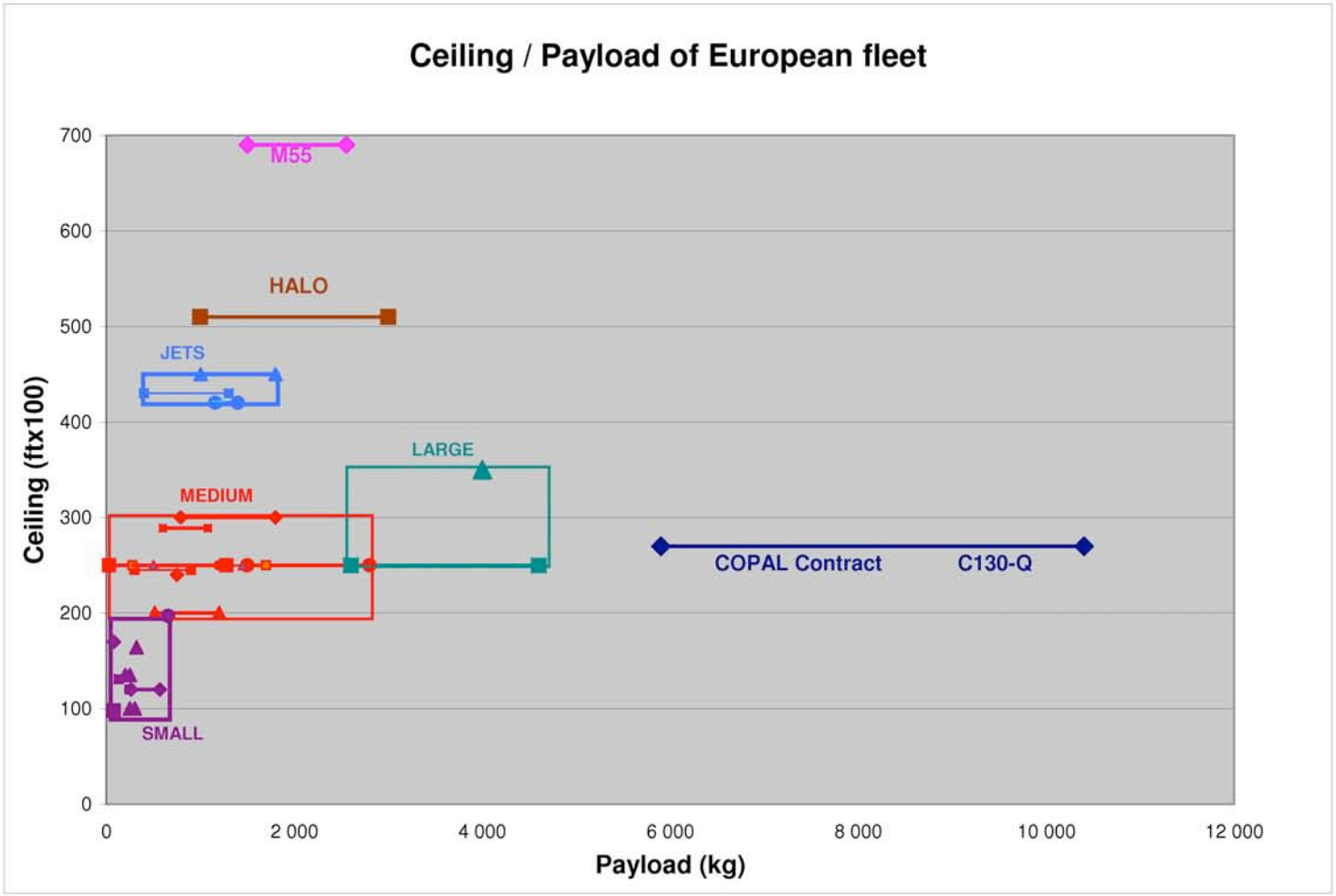






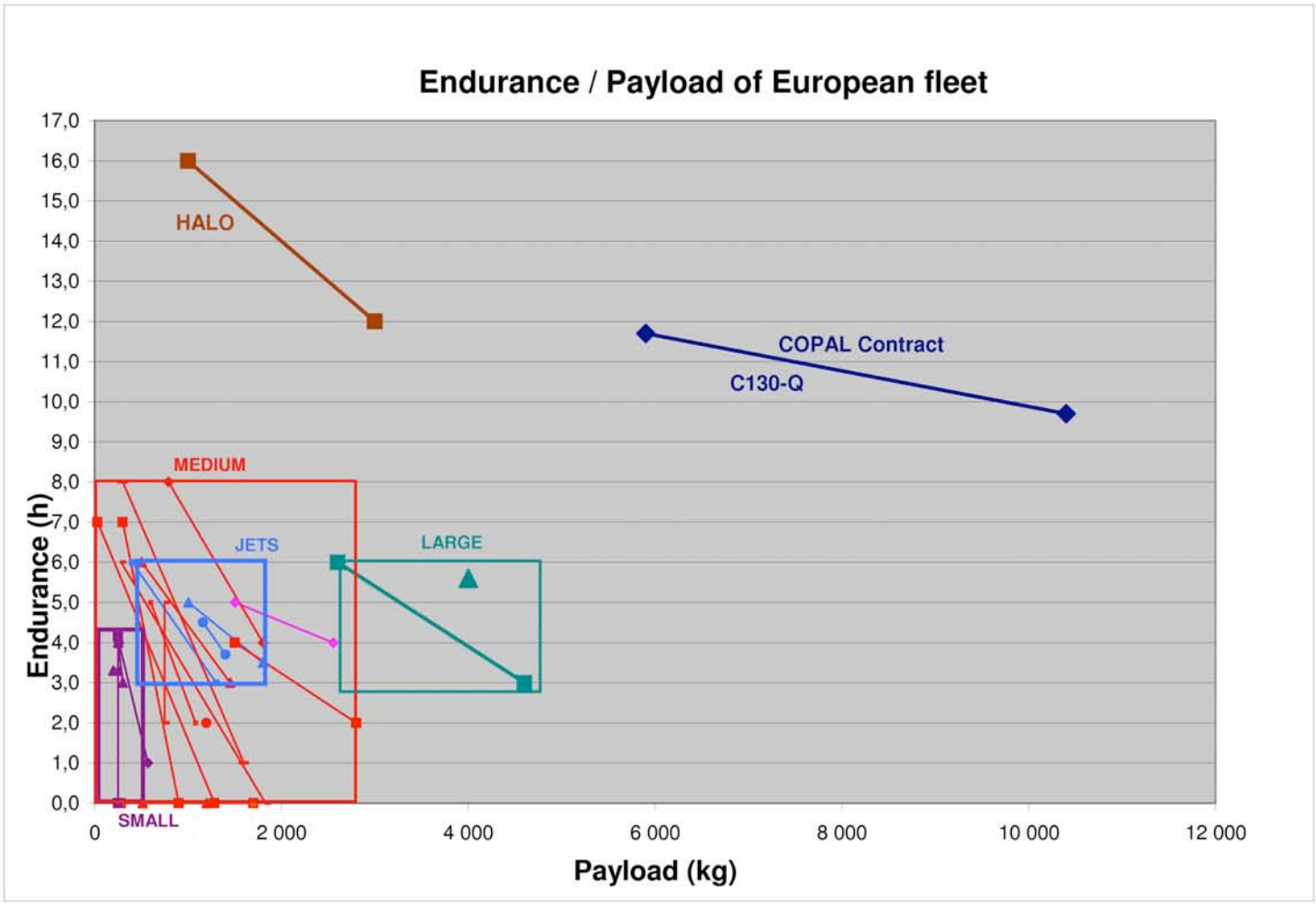

The existing European Fleet

Which aircraft model ? Pay-load / Ceiling



The existing European Fleet

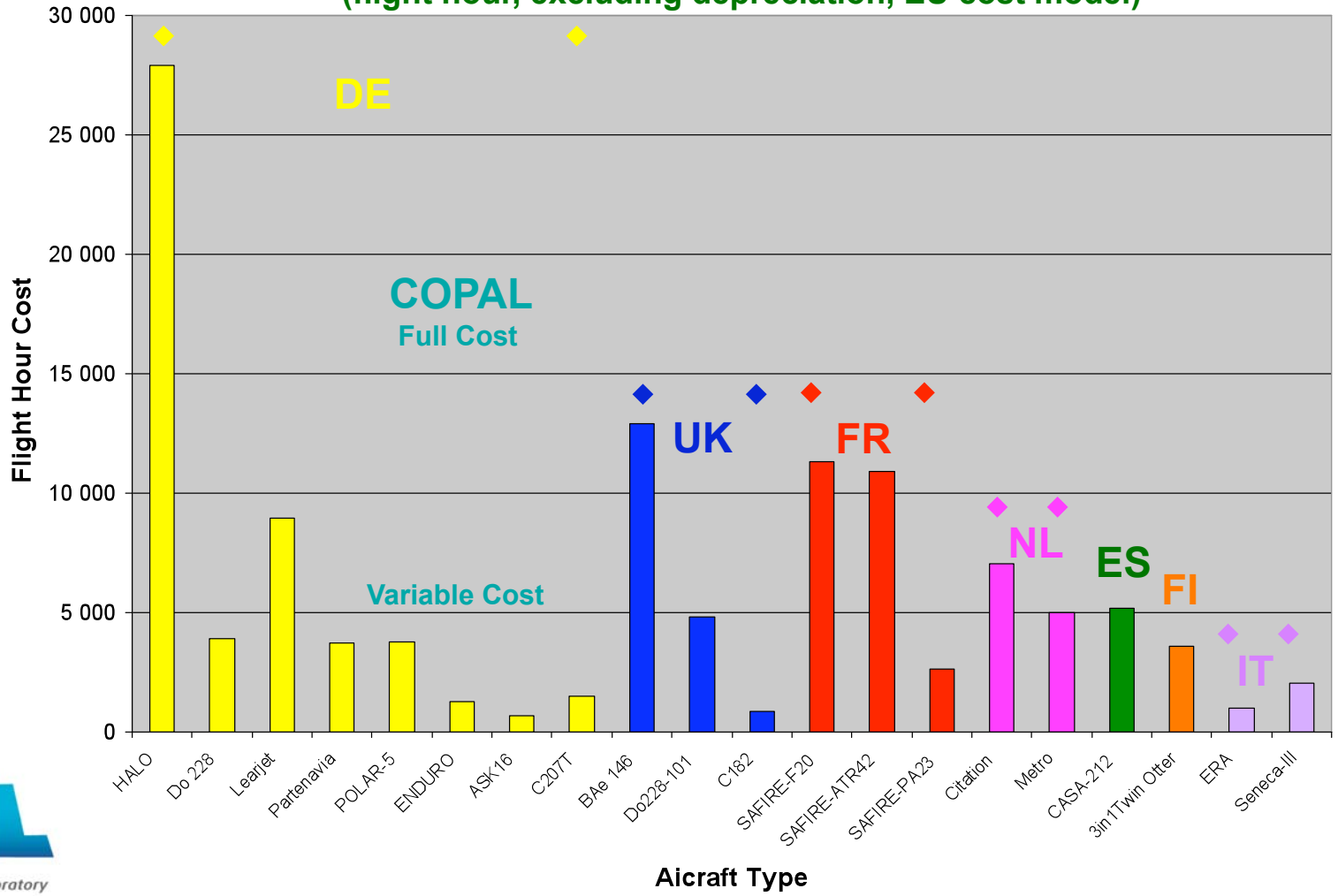
Which aircraft model ? Pay-load / Endurance



The existing European Fleet

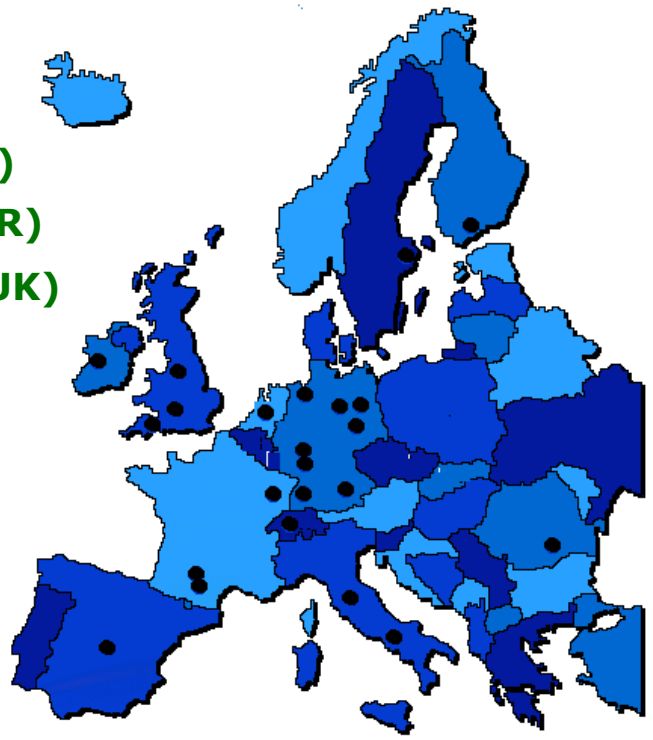
Which aircraft model ? Cost

(flight hour, excluding depreciation, EU cost model)



The EUFAR-FP7 Consortium

- Météo-France (FR)
- MetOffice (UK)
- DLR (DE)
- NLR (NL)
- Enviscope (DE)
- INSU-CNRS (FR)
- NERC-ARSF (UK)
- INTA (ES)
- GTK (FI)
- FUB (DE)
- FZK (DE)
- AWI (DE)
- CNR (IT)
- UNIMAN (UK)
- VITO (BE)



- FZJ (DE)
- JOGU (DE)
- BADC (UK)
- USZ (HU)
- UCAM (UK)
- UHEI (DE)
- UWAR (PL)
- COSINE (NL)
- IRSN (FR)
- COMAT (FR)
- VKI (BE)
- UZH (CH)
- WU (NL)
- ISBE (CZ)
- TAU (IL)
- UEDIN (UK)
- GFZ (DE)
- PML (UK)

EUFAR-FP7 Activities

- **Management (0,6 M€)**

Networking Activities (2 M€)

N1. Scientific Advisory Committee (CNRM-FR)
N2. TA coordination (MetOffice-UK)
N3. Future of the Fleet (Jülich-DE)
N4. Expert Working Groups (U Mainz-DE)
N5. Education and Training (VITO-BE)
N6. Standards and Protocols (DLR-DE)
N7. Airborne Data Base (BADC-UK)
N8. e-Communication (CNRM-FR)
N9. Sustainable Structure (CNRM-FR)

Trans-National Activities (TA) (3 M€)

Joint Research Activities (JRA) (2,4 M€)

JRA1 Evaluation of hygrometers (Jülich-DE)
JRA2 Quality layers for hyperspectral imaging (VITO-BE)
JRA3 Optical cloud drop spectrometer (IRSN-FR)

NETWORKING

N1-SAC

To provide the EUFAR Consortium with independent strategic recommendations on EUFAR objectives and long term developments

The Scientific Advisory Committee (SAC) will

• Provide advice to ***EUFAR*** on the needs of the broad scientific user community for airborne measurements

• Provide advice and guidance about the strategic directions that ***EUFAR*** is taking

• Assist the ***EUFAR*** management team in prioritizing activities, and identifying redundant and missing activities to meet the strategic goals

Chair: Prof. Bjorn Stevens, head Climate Research at MPI Hamburg

- Sandro Fuzzi (CNR Italy)
- Andreas Kääb (Univ Oslo, Norway)
- Jose Moreno (Univ Valencia, Spain)
- Kevin Noone (Univ Stockholm, Sweden)
- Michael Petrakis (Nat Observatory Athens, Greece)
- Ulrike Seibt (Univ Paris VI, France)
- Iwona Stachlewska (Univ Warsaw, Poland)
- Jeff Stith (NCAR, Boulder Colorado)

NETWORKING

N1-SAC To provide the EUFAR Consortium with independent strategic recommendations on EUFAR objectives and long term developments

N2-TAC To co-ordinate EUFAR Trans-national Access activities

In FP6, 74 proposals have been submitted to EUFAR, 46 user groups (corresponding to 232 users) were selected by the User Group Selection Panel.

A total amount of 2 361 998 € (+ T&S) was allocated to 44 projects, for a total of 404 flight hours. 2 projects were cancelled due to logistical reasons.

In FP7, more than 2.9 M€ is provisioned for access costs.

To improve the scientific impact of Trans-national Access, new evaluation criteria will be defined. The new strategy will be to reduce the number of field experiments, increase the amount of access units allocated to the selected ones and, when possible, allow clustering with existing cutting-edge experiments. To avoid double funding, the EUFAR contribution in a cluster will be distinct from the other contributions, and separately measurable.

NETWORKING

N1-SAC To provide the EUFAR Consortium with independent strategic recommendations on EUFAR objectives and long term developments

N2-TAC To co-ordinate EUFAR Trans-national Access activities

N3-FF To evaluate the performance of the existing fleet and identify gaps. To provide solutions for the long-term development of the fleet.

In FP6, the N3-FF working Group concluded that the main limitation of the European fleet was the endurance (5 flight hours max). HALO (Gulfstream-V), operated by DLR, will soon provide 3 tons of payload and more than 12 FH of endurance for research in the upper troposphere / lower stratosphere. The priority for a new infrastructure was thus given to a heavy payload and long endurance aircraft for research in the middle and lower troposphere. The proposal was selected in the ESFRI roadmap and the COPAL Preparatory Phase project funded by the European Commission.

In FP7, the priority will be to develop operational solutions for providing access to a stratospheric aircraft in Europe.

NETWORKING

N1-SAC To provide the EUFAR Consortium with independent strategic recommendations on EUFAR objectives and long term developments

N2-TAC To co-ordinate EUFAR Trans-national Access activities

N3-FF To evaluate the performance of the existing fleet and identify gaps. To provide solutions for the long-term development of the fleet.

N4-EWG To improve the expertise among the specialized scientists in the field of airborne research.
To facilitate the transfer of expert knowledge to users, operators, and funding agencies.
To compile the knowledge in a high-level handbook on "Airborne Physical Measurements – Methods and Instruments".

In FP6, 10 expert workshops have been organized on the following scientific fields: Certification and Operational Issues,

- Certification and Operational
- Design of New Instruments and Installations,
- imaging Remote Sensing,
- Active Remote Sensing,
- Gas-Phase Chemistry,
- Radiation,
- Stratospheric Measurements
- Aerosols / Cloud Microphysics
- Turbulence
- Thermodynamics.

NETWORKING : EWG

In FP7, new EWGs have been constituted, especially in the field of hyperspectral observation of the surface. International experts will contribute to the handbook on airborne measurements.

Support to airborne measurements:

Calibration/Validation (Tim Malthus)
Certification/Operation (Stefan Kommallein)
Instrument Integration (Phil Brown)
Imaging sensors (Koen Meuleman)
Processing (Daniel Schlaepfer)
Unmanned Aerial Systems (Jochen Reuder)
Polar Research (J. E. Kristjannson)
Stratospheric Research (Cornelius Schiller)

Specific measurement fields:

Thermodynamics (Martin Zoeger)
Turbulence (Marco Esposito)
Active Remote Sensing (Jaques Pelon)
Radiation (Jonathan Taylor)
Gas-Phase Chemistry (Jim McQuaid)
Cloud Microphysics (Manfred Wendisch)
Aerosols (Paola Formenti)
Vegetation applications (Michael Schaepman)
Water applications (Steve Groom)
Soil applications (Eyal Ben-Dor)

Handbook on
Airborne Measurements – Methods and Instruments

1. **Introduction**
   (Wendisch, Brenguier)
2. **Basic Thermodynamic and Dynamic Parameters**
   (Lenschow, M. Esposito)
3. **Gas Phase Measurements**
   (McQuaid, Schlager)
4. **Particle Sampling Issues**
   (Krämer, Twohy)
5. **In Situ Measurements of Aerosol Particles**
   (Petzold, Coe)
6. **In Situ Characterization of Clouds and Precipitation Particles**
   (Brenguier, Baumgardner)
7. **Radiation Measurements**
   (Wendisch, Pilewskie)
8. **Hyperspectral Remote Sensing**
   (Eyal Ben-Dor, Müller)
9. **Active Remote Sensing**
   (Pelon, Vali)

NETWORKING : E&T

In FP6, 2 Training Courses on Airborne Research Methodology have been organized

Boundary layer
Iasi, Roumania
10-20/07/2007
40 candidates, 27 selected
SAFIRE ATR-42

Aerosol/cloud
Utrecht, The Netherlands
17–25/04/2008
53 candidates, 20 selected.
FAAM BAe-146

European Community Airborne Laboratory

NETWORKING : EC

EUFAR.net
European Fleet for Airborne Research

home

About EUFAR | Aircraft & Experiments | EUFAR Activities | Search | Members

EUFAR Presentation | Members Directory | Contact | Links | FAQ | Help

Welcome to EUFAR.NET

EUFAR is an Infrastructure Cooperation Network of the European Commission HPRI programme under FP5/FP6. EUFAR aims at coordinating the operations of the European fleet of instrumented aircraft in the field of environmental research in the atmospheric, marine, terrestrial and Earth sciences.
Read More

Members

Login :

Password :

SUBMIT

Forgotten your password?
Join the EUFAR network

fast Access

-Select an aircraft-

-Select a working group

? Help

Frequently Asked Questions
Help
Report bugs

Transnational Access

Get 100% funded flight hours for your experiments!
The European Commission supports access to EUFAR research aircraft for research campaigns.

Flight hours TA Application form

Education & Training

Training for university students:
- Get 100% funded flight hours for your scientific experiment using aircraft
- Join existing research campaigns
- Attend EUFAR summer schools on airborne research

Education & Training Activities

Expert working groups

12 Expert Working Groups meet at workshops and provide recommendations to aircraft operators, funding institutions and researchers.
If you are an experienced researcher involved in airborne measurements, how about joining them!

Expert Working Groups

What's New?

Contact : bureau@eufar.net

NETWORKING

N6-SP

To develop common protocols for airborne hyperspectral remote sensing
To support users and operators with recommendations on best practice and state-of-the-art software for airborne data pre-processing
To develop and publish open source software toolboxes for higher level data products, and data analysis
To define standards for data transfer in real-time

N7-DB

To provide a centralised gateway to data acquired onboard aircraft (both in situ and remote sensed) along with supporting metadata, collected by the aircraft of the EUFAR Fleet.

N8-EC

To elaborate solutions on Internet for the dissemination of the EUFAR information, for facilitating the electronic submission of trans-national access proposals, and their evaluation by the EUFAR User Group Selection Panel, and for providing all EUFAR working groups with a secured domain for collaborative activities.

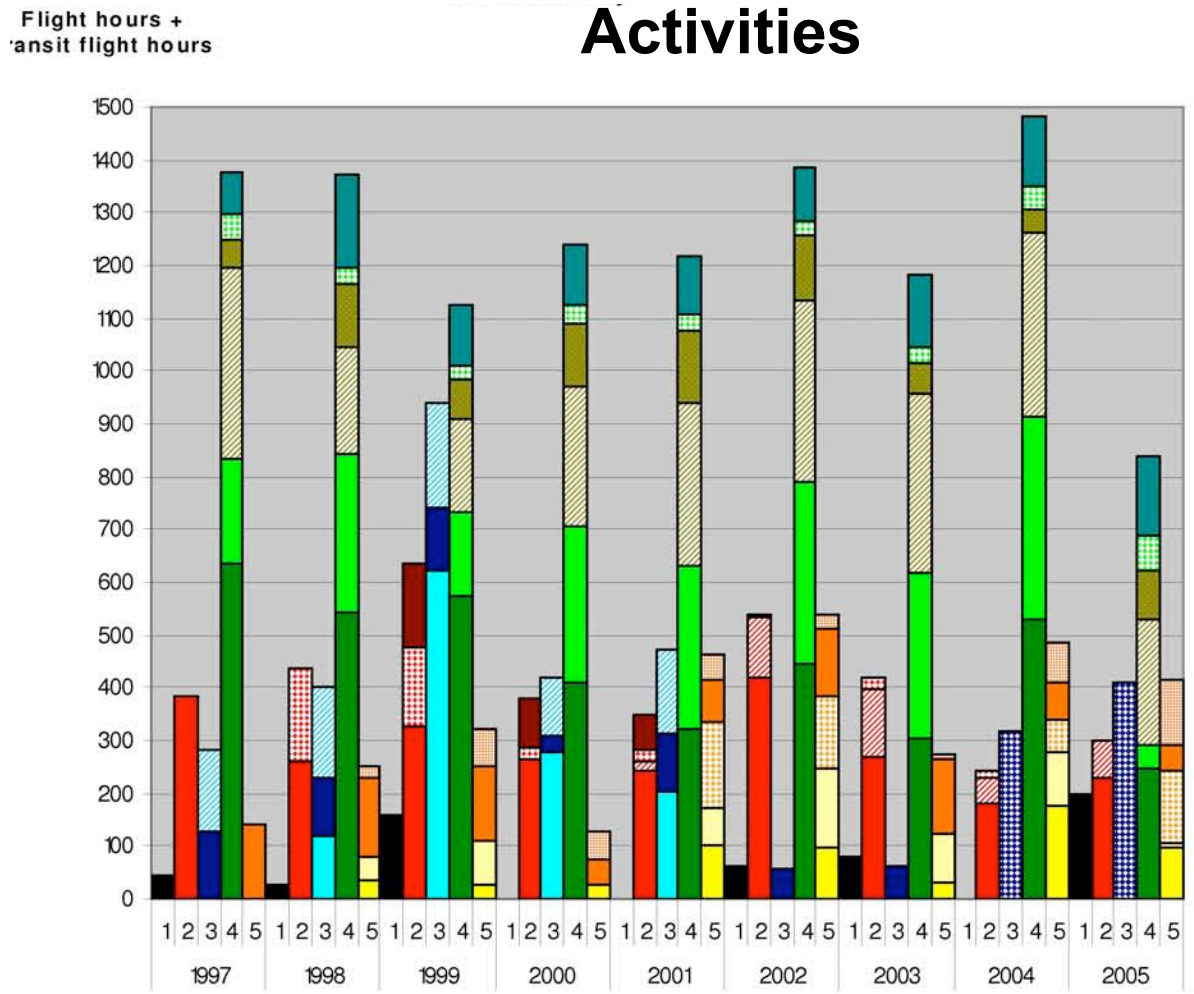
N9-SST

To develop a framework for a sustainable EUFAR structure, by
- evaluating possible models of legal structure for a joint management of the network,
- promoting the extension of trans-national access beyond Community support
- compiling information on the activities of the fleet and their scientific impact to support strategic decisions
- developing coordination with the COPAL Preparatory Phase study and the international community of research aircraft operators

NETWORKING : SST

Monitoring the activities of the fleet and its scientific impact

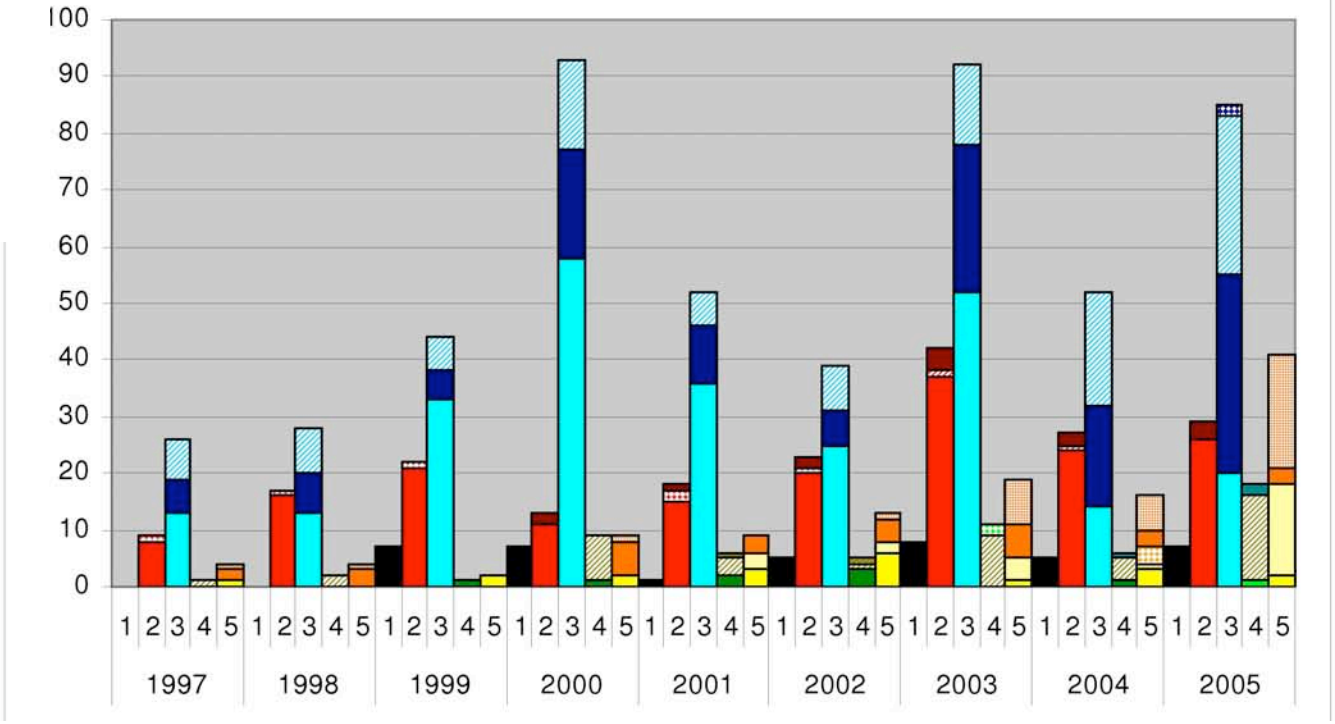
Activities



NETWORKING : SST

Monitoring the activities of the fleet and its scientific impact

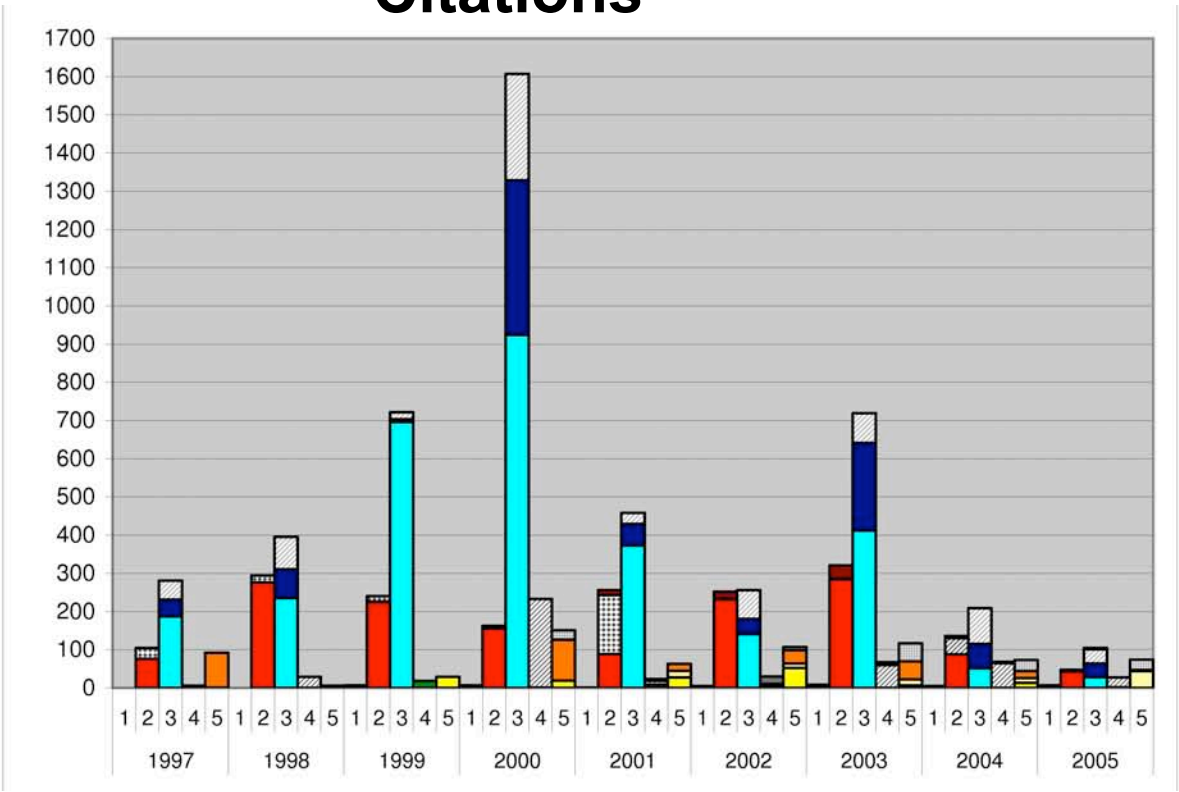
Publications



NETWORKING : SST

Monitoring the activities of the fleet and its scientific impact

Citations



The EUFAR-FP7 Activities
NETWORKING

ISPRS-WG I/1 - Standardization of Airborne Platform Interface

1. *Chair : Andrew Roberts / USA / NASA / andrew.c.roberts@nasa.gov*
2. *Co-Chair: Jean-Louis Brenguier / France / Meteo / jlb@meteo.fr*

Secretary: James Huning / USA / SAIC / jimhuning@gmail.com

1) Coordinate a forum for discussion between the international airborne science communities

2) Develop airborne sensor interface format standards in coordination with other working groups to promote maximum sensor portability between aircrafts increasing science yield from the sensors.

3) Develop airborne satellite data relay systems use for science research programs between aircraft and ground in coordination with other working groups

4) Develop an airborne science literature search to identify peer reviewed published papers and citations and make a available in a data base.

5) Support the regulatory agencies in supporting airborne science sensor certification and approval requirements for Lidar, Dropsonde and electromagnetic spectrum emissions.

6) Maintain an inventory of the international airborne science capabilities and report annually.

7) Develop a forum to discuss transnational access system(s) for airborne users.

8) Support the use of UAS vehicle activity for science observations in civil and restricted airspace on an international basis and engage the ICAO.

9) Promote the education and outreach on an international basis of airborne based science activity.

10) Develop a forum to coordinate expert international workshops in categories of airborne science sensors for both Remote Sensing and insitu systems.

Trans-national Acces

- **To provide access to research aircraft or instrumentation that is not available via the user's own national research funding.**

- **Principal eligibility criteria:**
  - The proposer and the majority of the user group should be employed at institution in an EU Member State or Associated State
  - The infrastructure (aircraft or instrumentation) to which they propose access should be from a different EU Member State

- ***Three types of TA projects***
  - *Science projects*
  - *Summer schools*
  - *Instrument development*

JOINT RESEARCH

JRA1

Development and characterisation of novel or improved compact airborne hygrometers for different airborne applications within EUFAR; including investigation of the sampling characteristics of different gas/ice inlets and the development of an improved ultra fast thermometer for near- and in-cloud measurements

JRA2

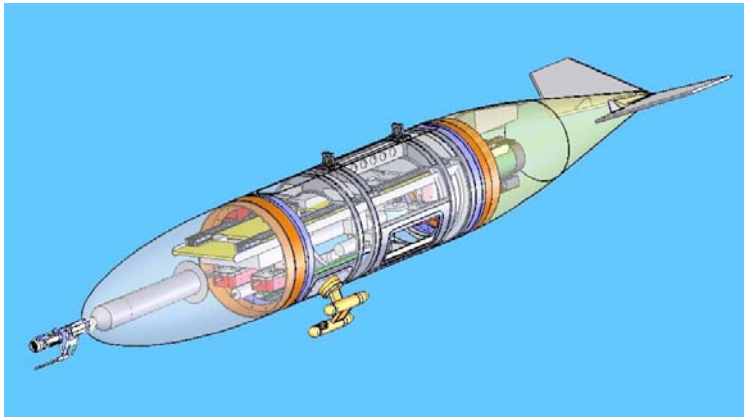
- To develop quality indicators and quality layers for airborne hyperspectral imagery
- To develop quality indicators and quality layers for higher level data products
- To implement and to test quality layers in existing processing chains of airborne hyperspectral imagery
- To develop higher performing water and soil algorithms as demonstrators for end-to-end processing chains with harmonized quality measures

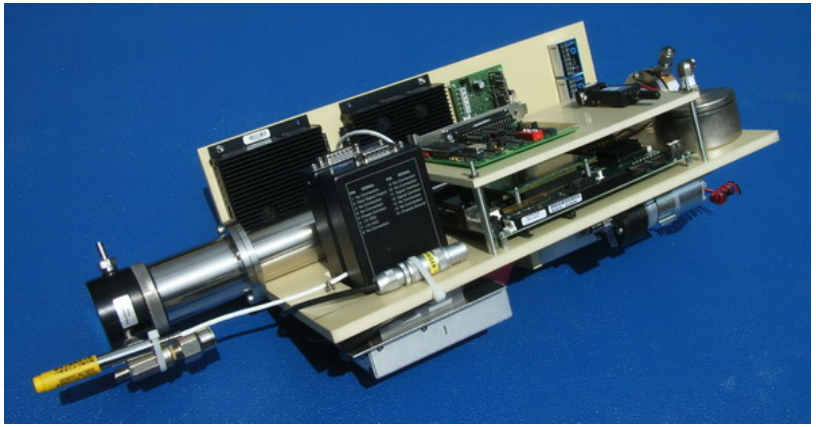
JRA3

To design and construct an airborne drop spectrometer based on a new principle, that provides absolute measurements of the drop size and a large sampling section (laser interferometer).

JOINT RESEARCH

In FP6, a consortium of European laboratories developed a unique system for measurement of aerosol physical and optical properties in two portable pods





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COPAL Preparatory Phase

COPAL aims at providing the European scientific community in the field of environmental and Geo-sciences, with a unique research aircraft platform, capable of reaching and operating in any remote area in the world. It will offer an unprecedented opportunity to countries that are not yet operating research aircraft to develop expertise in airborne measurements and participate to international multidisciplinary experiments.

With a payload of **10 tons or more and an endurance of 10 hours**, a heavy-payload, long endurance (HPLE) aircraft will more than double the capabilities offered to European scientists.

COPAL Consortium

Beneficiary Number *	Beneficiary name	Beneficiary short name	Country	Date enter project	Date exit project
1	Météo-France, Centre National de Recherches Météorologiques	CNRM	FR	Month 1	Month 48
2	Instituto Nacional de Técnica Aeroespacial	INTA	ES	Month 1	Month 48
3	Finish Meteorological Institute	FMI	FI	Month 1	Month 48
4	Natural Environment Research Council	NERC	UK	Month 1	Month 48
5	Fundação para a Ciência e a Tecnologia	FCT	PT	Month 1	Month 48
6	Consiglio Nazionale delle Ricerche	CNR	IT	Month 1	Month 48
7	General Secretariat for Research and Technology	GSRT	EL	Month 1	Month 48
8	University of Warsaw, Institute of Geophysics	IGFUW	PL	Month 1	Month 48
9	Enviscope GmbH	Enviscope	DE	Month 1	Month 48
10	The Meteorological Office	Met.Office	UK	Month 1	Month 48
11	Centre National de la Recherche Scientifique	CNRS	FR	Month 1	Month 48
12	SJ Berwin LLP	SJ BERWIN	UK/BE	Month 1	Month 48

COPAL Activities

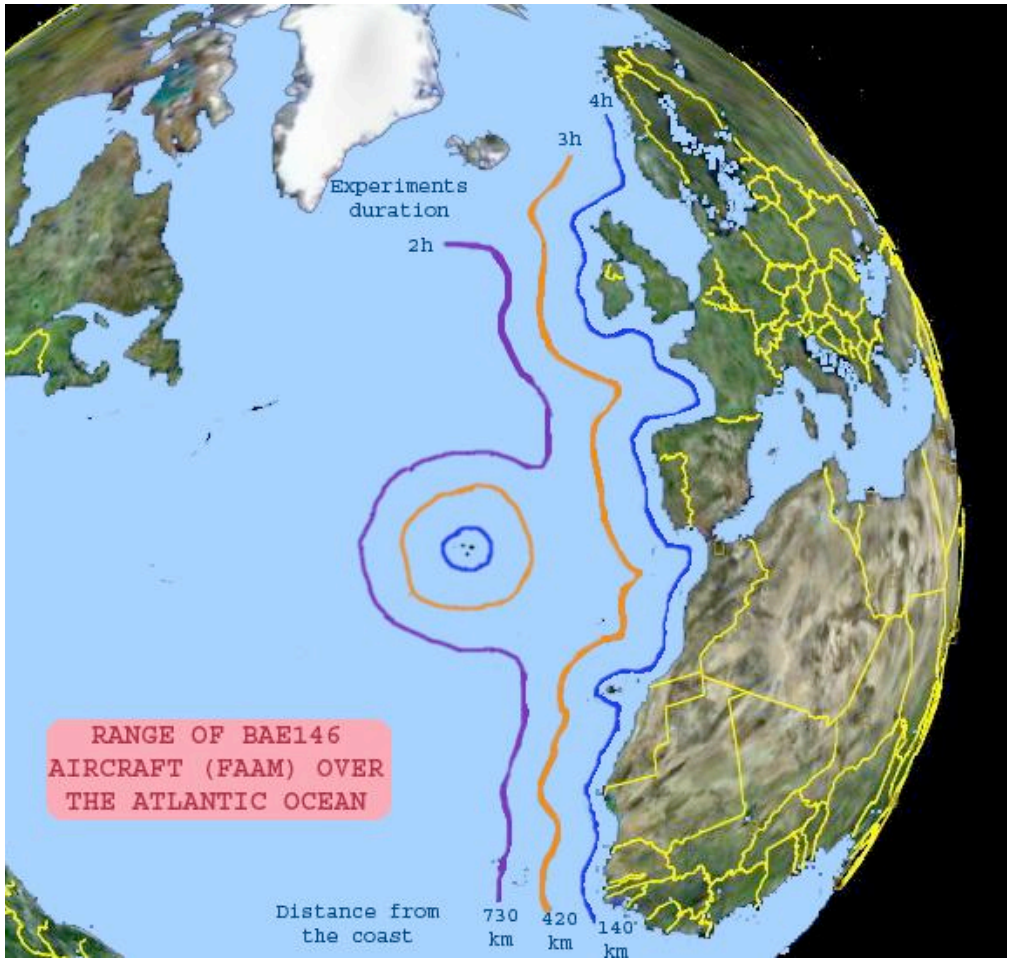
Feasibility Study for procurement, refurbishing, modification and instrumentation of a heavy-payload (10 Tons) and long-endurance (10 hours) aircraft for research in the lower and middle troposphere.

- Propose a legal structure for joint management of the COPAL aircraft
- Quantify the costs for procurement, refurbishing, modification for research, certification, and operation of the COPAL aircraft
- Designate the aircraft operator and scientific operator of the COPAL aircraft
- Constitute a network of academic laboratories and SME for development, maintenance and operation of research instrumentation
- Define the governance model for access proposals evaluation and allocation of flight time

Performance of the EUFAR fleet

The endurance is the main limitation of the European fleet

With and endurance of 5.5 hours, the Bae-146 (UK) is limited to a few hours of scientific activities in remote areas such as the ocean, polar regions or underdeveloped countries (Sahel))



Rationale for COPAL

Participation in COPAL is a strategic decision for countries, which have not yet invested in airborne research infrastructures

An investment of 5 M€ is just sufficient for procurement, modification and instrumentation of a medium size tropospheric aircraft (Merlin-IV), with less than 1 ton of payload and 3 hours of endurance

It is difficult to develop rapidly all fields of expertise necessary to operate a research airborne infrastructure (dynamics, radiaiton, chemistry, microphysics,…)

At the national level, the facility will therefore be focused to address some specific fields, for a limited user community. The aircraft will therefore be used well below its optimum potential (600 flight hours /year).

An initial budget of 5 M€ is difficult to obtain from research funding institutions

The concept of Community Airborne Laboratory (NCAR/C130)

During international experiments, 15 to 20 research laboratories contribute to the multidisciplinary instrumental setup (dynamics, chemistry, aerosol, radiation, remote sensing) that is necessary to address crucial issues such as climate and general circulation.

EUFAR Conference on Airborne Research last two weeks in October 2010

- **Scientific Conference at Météo-France Amphitheatre: 300 people**
  - 4 meeting rooms each for 40 people
  - Possibility to use more meeting rooms in adjacent buildings
- **Duration**
  - 2 weeks EUFAR/ COPAL activity meetings, the EUFAR GA, and the COPAL Steering Committee and Governing Board meetings.
- **Aircraft show at Toulouse-Blagnac airport**
  - Joint ICCAGRA/EUFAR Air-show
  - 2 days, one for institutional, one for the public

ICCAGRA

NASA-ER2
NSF-C130
NOAA–P3

EUFAR

NERC-Do228
Enviscope Learjet or Partenavia
FZK-Ultra-light
AWI Polar5
DLR GV
FUB Cessna207 or ASK16
BGS Twin-Otter
UNIMAN Cessna
FAAM BAe-146
SAFIRE ATR-42/F20 & Piper-Aztec

Research Aircraft Show

- **Static show on the tarmac or in the hangar**
  - Agreement with Airbus to use their former airbus delivery hangar
    - Support from airport authorities for security and logistics
  - Financial Support from local authorities and EC

- **Test Flights for inter-calibration**
  - Real time transmission to the ground
  - Display on a screen in the hangar
  - Coordination with air traffic control for flight in the test flight restricted area (South of Toulouse 50x25 NM)

?? ICCAGRA PARTICIPATION ??

COPAL
European Community Airborne Laboratory

PP and I3
Questionnaire on Exchange of Experience
Management
Legal structure
Open Access
Education & Training
Webservices

(Jean-Louis Brenguier, EUFAR/COPAL coordinator)

Contributions received from 8 PP, 8 I3, & 1 DS projects

	PP Projects									I3 Projects									
	BBMRI	LIFEWTACH	ESFRUP	ECRIN	EMSO	COPAL	INFRAFRONTIER	DARIAH	Total	EARLINET ASOS	EVN	HPC EUROPA 2	EUFAR	IMECC	OPTICON	SYNTHESYS	NMI3	NFFA DS	Total
Single sited or Distributed RI	/	DIS	SS	DIS	DIS	DIS	DIS	DIS	7	/	DIS	DIS	DIS	/	DIS	DIS	DIS	DIS	6
Central Management	/	X	X	X	X	X	X	X	7	/	X	X	X	/	X	X	/	X	6
Legal Structure	/	X	X	X	X	X	X	X	7	/	/	X	X	/	X	X	/	X	5
Pan-European Access	/	X	X	X	/	X	X	/	5	/	X	X	X	X	X	X	X	/	6
Education and Training	/	X	X	X	X	X	X	/	6	/	X	X	X	/	X	X	/	/	5
Web Services	X	X	X	X	X	X	X	X	8	X	X	X	X	X	X	X	X	X	8

I3 & PP Management

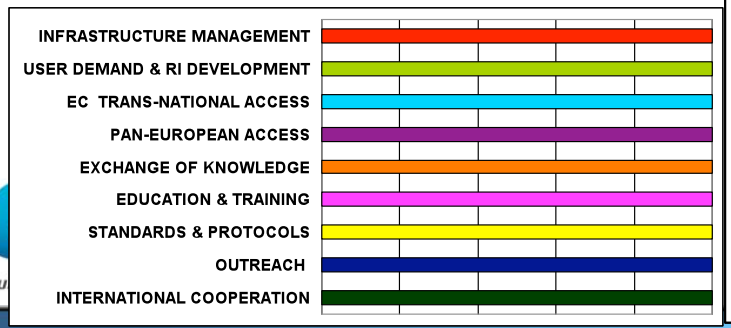
Management of distributed RIs comprises diverse activities. Some can be managed at the facility level, providing they are coordinated at the network level, some are more efficiently managed by a central office.

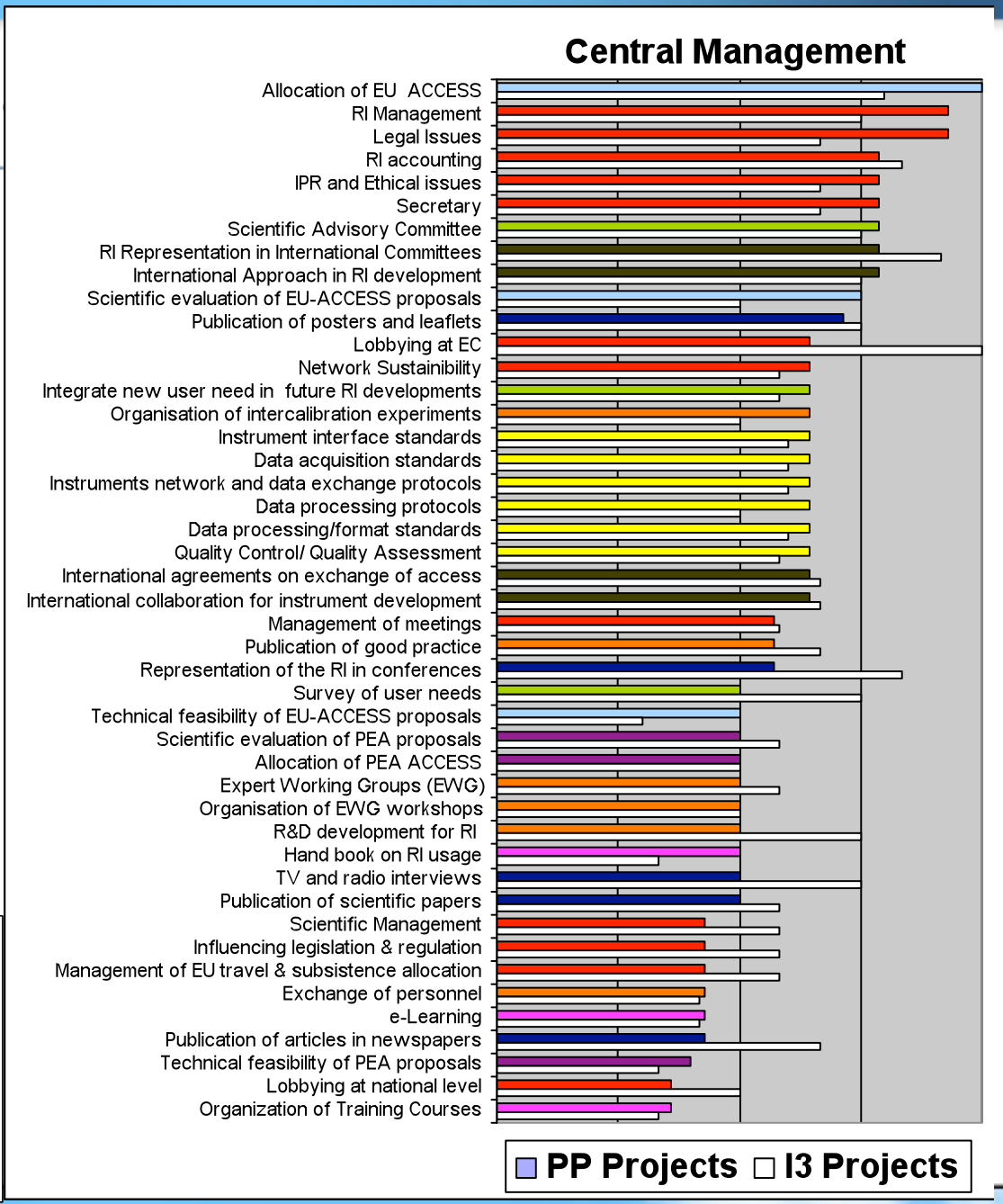
The following types of activities were considered :

- INFRASTRUCTURE MANAGEMENT
- USER DEMAND & RI DEVELOPMENT
- EC FUNDED TRANS-NATIONAL ACCESS
- PAN-EUROPEAN ACCESS
- EXCHANGE OF KNOWLEDGE
- EDUCATION & TRAINING
- STANDARDS & PROTOCOLS
- OUTREACH
- INTERNATIONAL COOPERATION

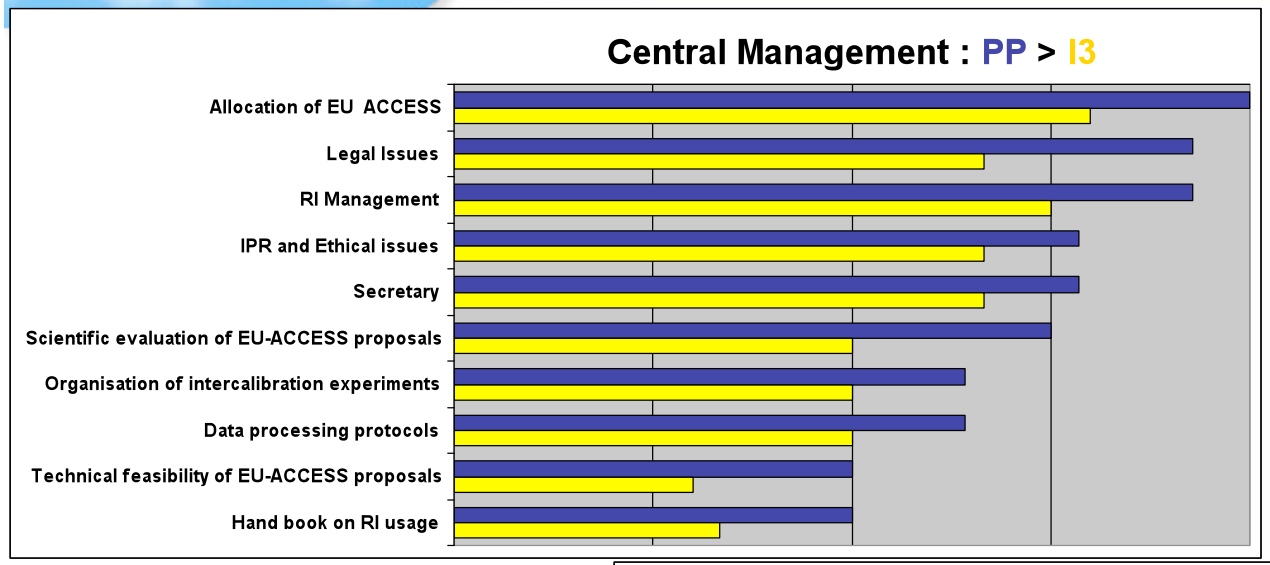
EUFAR.net
European Fleet for Airborne Research

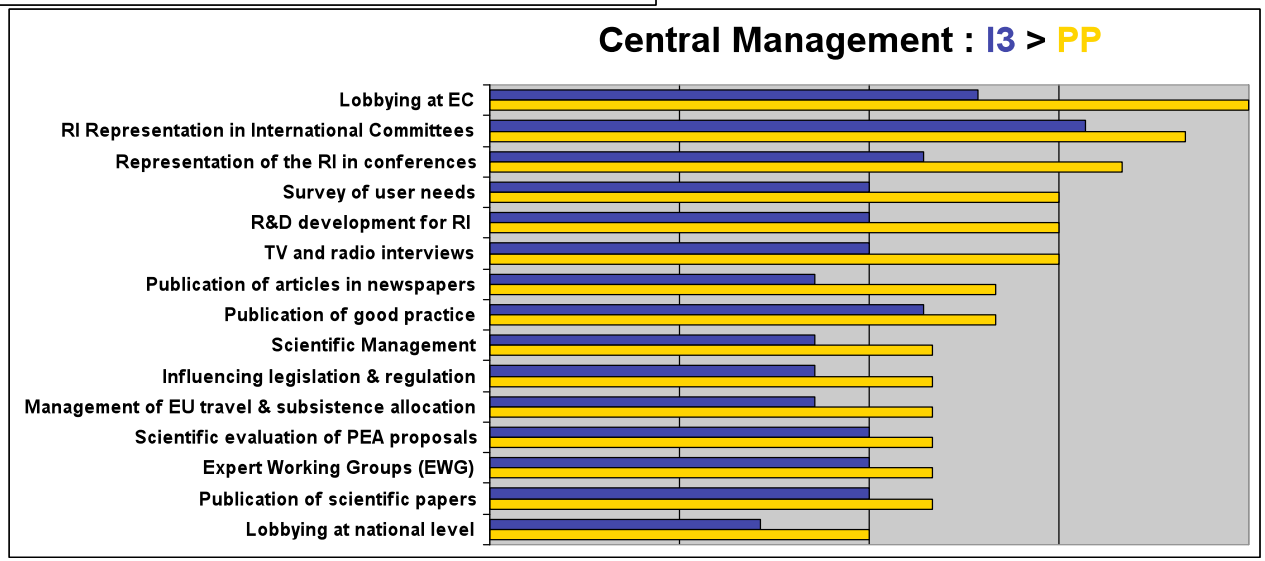
I3





I3 & PP Management






Thank you
for your attention